

REMARKS

Summary of Office Action

Claims 1-17 are pending.

Claims 1-17 have been rejected under 35 U.S.C. § 102(e) as anticipated by Stilp U.S. Patent No. 6,184,829 (“Stilp”). Claims 7-9 have been additionally rejected under 35 U.S.C. § 102(b) as anticipated by Heller U.S. Patent No. 5,119,104 (“Heller”).

Applicants Reply

Applicants have cancelled claims 2 and 15, and amended independent claims 1, 7, 11 and 14 for clarity.

Applicants respectfully traverse the prior art rejections.

Applicants’ invention relates to methods and system for accurately locating a mobile wireless communication device (e.g., a laptops, pager, or PDA, etc.), which is in radio communication with a wireless network (e.g., a WAN). The methods and system involve comparison of the arrival times of a reference data packet broadcast by the mobile device at two receiving station and hyperbolic trilateration to geographically locate the mobile device. Further, the methods and system involve synchronization of the internal clocks of the receiving stations.

The synchronization of the internal clocks is achieved in a simple manner. According to claims 1, 7, 11 and 14, the synchronization of the internal clocks involves:

- (1) transmitting a series of reference data packets from a beacon at a known position proximate to a geographical center point of a first pair of receiving stations A and B
- (2) assuming that the beacon is at the geographical center point;

(3) correlating/plotting the arrival times (t_A , t_B) of the reference packets at a pair receiving stations (A, B) against each other.

(4) computing a linear polynomial fit $t_B = m t_A + b$, where slope m is function of the difference in the frequencies of the internal clocks of the receiving stations A and B, and y-intercept b is the offset due to different start times of the internal clocks of the receiving stations A and B,

(5) determining a bias for the internal clocks using known difference in distance between the beacon and the receiving stations A and B, and

(6) synchronizing the internal clocks of the first and second receiving stations based on the slope m , the offset b and the bias.

Applicants respectfully submit that these claim elements are not shown in the cited prior art — Stilp and Heller.

Stilp

As noted by applicants in the previous Reply, Stilp is concerned with methods and apparatus for calibrating a wireless location system to make highly accurate Time Delay of Arrival (TDOA or FDOA) measurements. Stilp discloses an internal calibration method in which measured mobile device TDOA values are compared with theoretical TDOA values associated with fixed transmitted locations. Stilp's calibration method is complex and involves "injecting a comb signal into the first receiver system; utilizing the comb signal to obtain an estimate of the manner in which the transfer function varies across the bandwidth of the first receiver system; and utilizing the estimate to mitigate the effects of the variation of the first transfer function on the time measurements made by the first receiver system" (See e.g.,

Abstract). Stilp relies on an external time reference signal to set, adjust, or commonly synchronize individual receiver clocks. (See e.g., col. 9 line 60- col. 10 line 19).

Stilp does not show, teach or suggest the methods and system of claims 1, 7, 11, and 14.

In this Reply, applicants further note that the portions of Stilp (i.e., col. 21:50 -24: 24 and col. 70:24 - col. 73:50) cited in the Office Action (§ 5) do not relate to “clock synchronization”. Stilp at col. 21:50 -24: 24 describes an external calibration method to make highly accurate Time Delay of Arrival (TDOA or FDOA) measurements with reference to FIG. 2G. Stilp’s external calibration method is designed to correct systemic errors in the front end electronics. (See e.g., col. 22 lines 37-49). Stilp defines these systemic errors (e.g. ϵ_1 and ϵ_2) as the difference between actual and theoretical TDOA values. (See e.g., col. 22 lines 54-59). Stilp uses “a weighted average of error values” to adjust the measured TDOA value for a target wireless transmitter at an unknown location. (See e.g., Equations, col. 22 lines 60 - col. 23 line 14). The weighting factors k_1 , k_2 , k_3 are empirically determined by an operator. (See e.g., col. 23 lines 16-25).

Stilp at col. 70:24 - col. 73:50 describes “a band width synthesis method” for estimating TDOA. Stilp describes cross-correlating received signals (e.g., $R(f) = X(f) * Y(f)$) to determine fringe phases that are then used to estimate or find maximum like-hood TDOA. (See e.g., col. 70 lines 24 - col. 71 line 11).

In particular, the cited portions like the rest of Stilp do not show, teach or suggest the “clock synchronization” methods and system of claims 1, 7, 11, and 14.

Therefore, these claims 1, 7, 11, and 14 (and their dependent claims) are patentable over Stilp.

Heller

Claims 7 -9 have been rejected as anticipated by Heller.

Applicants have amended claim 7 to explicitly recite that the clock synchronization step takes place according to the method of claim 1.

As noted by applicants in the previous reply, Heller concerns a radio-location system for tracking for tracking objects in multipath environments such as semiconductor fabrication or manufacturing facility. Heller describes using radio tag IDs to locate tagged objects in the manufacturing facility. Heller uses “system wide clock synchronization” based on a reference processor clock signal to synchronize to correct the time of arrival of a radio signal transmitted by an object at an individual receiver.

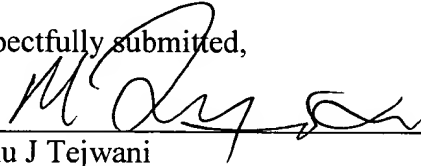
Like Stilp, Heller does not show, teach or suggest claim 7 (that includes the synchronization method of claim 1).

Therefore, claims 7-9 are patentable over Heller.

Conclusion

This application is now in condition for allowance. Reconsideration and prompt allowance of which are requested. If there are any remaining issues to be resolved, applicants respectfully request the Examiner to kindly contact the undersigned attorney by telephone for an interview.

Respectfully submitted,



Manu J Tejawani
PTO Reg. No. 37,952
(212) 408-2614

Attorney for Applicant

BAKER BOTTS L.L.P.
30 Rockefeller Plaza
New York, NY 10112